The Volcanoes of Hawaii in 1868

---BY C. H. HITCHCOCK ---

The eruptions from Kilauea and Mauna Loa in 1868 were very remarkable. The prevalent view for several years was that the lava came from Kilauea, crossing over to Kahuku beneath the surface from near the old half-way house in Kau. The lava certainly left Kilauea; but because none of it appeared near Kapapala it was assumed that the exit of the flow was at Kahuku. Dr. Titus Coan explored Kau five months after the breakdown in search of the lava that must have issued forth. He took the road from Puna to Kau which passes the Kamakaia hills about eleven miles southwest from Kilauea, but neither saw nor heard anything of the great discharge which actually issued from rents some three or four miles nearer the sea. Had he taken the road skirting the shore from Keauhou to Punaluu he would have passed over the new lava, and by its description have saved months of fruitless discussion and years of misunderstanding. Strangely enough, nearly forty years elapsed before this flow was discovered by E. D. Baldwin in his surveys of the Kapapala district made under the direction of Walter E. Wall, territorial surveyor, and published in 1907. No one of the scientific explorers who had visited Kau during this interim traversed this trail near the sea shore; the better road through Kapapala was always preferred.

The early visitors to this field of Kau, from whose observations reliable information is obtained were Judge F. S. Lyman of Hilo, H. M. Whitney, Dr. W. Hillebrand, Dr. T. M. Coan, the historian Abraham Fornander, and others. Doctor Brigham in commenting upon these statements could not agree with Doctor Coan that the lavas from Kilauea and Mauna Loa effected a junction before reaching the surface at Kahuku. He conjectured that the flow from Kilauea passed into the sea near Punaluu like the 1823 stream as described by Ellis. Professor Dana said that the "curving of the Kilauea fissures from Kapapala toward the coast seems to point to a submarine discharge off that part of the island." W. L. Green maintained that whether a part of the Kilauea lava escaped on the Mauna Loa fissure may well remain an open question.

It will now be proper to present the history of these volcanic displays in the light of present knowledge, the chief events in the order of occurrence being (1) the illumination over Mokuaweoweo; (2) the earthquakes; (3) the discharge from Kilauea; (4) the landslide; (5) the sea waves; (6) the eruption at Kahuku.

(1) On March 27 whaleships at Kawaihae observed early in the morning a dense column of smoke rising to the height of several miles with a bright reflection cast by the lavas in the pit of Mokuaweoweo. The same were seen by T. D. Paris at Kealakekua. March 27, slight earthquakes were felt in Kau and Kona, becoming more energetic on the following day, extending northerly in Kona and easterly to Hilo. On the 28th the light on the summit was seen in Hilo by Doctor Coan. F. S. Lyman reports, as seen from his home at Keaiwa in Kau, an outbreak of lava on the southwest side of the summit at this time, and a line of smoke fifteen miles towards Kahuku on the 30th. These various facts prove the presence of lava in the summit caldera as the first stage in the history of the eruptions. Thus far the manifestations were comparatively quiet.

(2) The earthquakes became more pronounced. There were 50 to 60 distinct shocks in Kona in one day. At Kau over 300 during the same period. At Kilauea the surface was aquiver for days together with frequent vigorous shocks that would cause, lamps, crockery and chairs to spin around as if animated. At one time it seemed as if a projectile from a cannon struck the ground directly under the bed of the proprietor, causing him to flee from the house without ceremony. Between March 28 and April 11 there were said to have been 2000 distinct shocks in Kau. The nervous strain caused by these disturbances must have been well nigh intolerable.

The culminating shock came at 3:40 p. m. of April 2. Every stone wall, and the more substantial houses in Kau were thrown down, men and animals were overthrown. People had to sit on the ground bracing with hands and feet to keep from rolling over. A large stone church in Waiohinu collapsed in ten seconds. In Kona the overturnings were less complete. The only stone house in Hilo was thrown down and furniture was disarranged. The shocks were very powerful at Keauhou. It was felt slightly in the other islands, Maui, Molokai, Oahu and Kauai. The shocks were sometimes undulating, sometimes like jerks and again a thumping, all attended by a rattling noise like distant artillery.

(3) Events at Kilauea. The great shock came at 4 p. m. April 2, followed by another almost as noticeable at 12:30 a. m., April 4. The ground rocked like a ship at sea, fearful detonations were heard in the pit, lava overflowed into Kilauea-iki from near the rent of 1832, and large portions of the walls tumbled down. From the very first the fires began to recede. More than half of the old floor caved in, the greatest depth of 500 feet being at the south end or Halemaumau—the breadth 3000 feet at the top and half as great midway. The whole depression was not manifest at first, and the limits better defined some years later: being approximately 8000 feet long, 6000 feet wide at the north end and 3000 at the south. This is about the same with the discharge of 1840. There has been no flow since 1868 of sufficient consequence to find its way to the surface above the sea level. The flow of 1894 was the next to this in size but no one has discovered where it went—most probably below the sea level.

Two illustrations are presented to show the breakdowns in 1840 and 1868. The first (A) is based upon the observations of Admiral Wilkes, as corrected many years later by Professor Dana, and drawn by F. S. Dodge for the government survey. The black ledge was 650 feet below Uwekahuna, the highest point upon the west side; another lower pit was 342 feet deeper. The whole area of the pit was a liquid mass, with waves insinuating themselves into the walls and thus detaching great masses of rock. The fire was first noticeable May 30. Three days later, after an underground passage of twenty-seven miles from Kilauea, the vent appeared eleven miles from the sea and 1244 feet above tide water. For three weeks the fiery torrent poured over a cliff at Nanawale into the sea. Evidently there was an absence of earthquakes in connection with this flow.

Illustration B shows the area of the breakdown in 1868. If placed over the earlier one in A, the ragged promontory in the northwest part will be cut off; there is a notch on the side towards Kilauea-iki, and it is broader towards the sulphur banks. The outlines of the later breakdown seem to have been determined by the earlier one, and a more minute study would show signs of the boundaries of the 1886 and 1894 lakes and the present Halemaumau. The areas of the 1840 and 1868 pits have very nearly the same cubic dimensions.

4. The landslide coincided with the culmination of the earthquake on April 2. For a distance of three miles a mass of earth, moistened by springs, from a half of one to two miles wide, and with a maximum thickness of thirty feet, was dislodged by the shock and swept down the hillside. It carried with it trees, animals and men. Thirty-one lives were lost, and between five hundred and one thousand head of cattle, horses, goats and sheep, the part owned by one person being estimated of the value of $16,000. The earth was red, much like lava in color, and at first some thought it was a volcanic discharge.

5. Also coincident with the culminating shock was an earthquake wave, washing the shore from Hilo to the South Cape, being the most destructive at Keauhou, Punaluu and Honuapo. One hundred and eight houses were carried away and forty-six lives lost. At Hilo the sea receded more than one hundred feet, and the wave was ten feet high. Wreckage was carried inland eight hundred feet at Keauhou. The walls of stone buildings were thrown seaward by the shock, followed by the collapse of the roof. A stone church and other buildings were destroyed at Punaluu. At Kaalualu wreckage was carried inland eight hundred feet, and the wave rose to the height of twenty-five feet. Not a house was left at Honuapo.

6. The earthquakes clearly belonged to the class denominated volcanic, rather than tectonic. They were directly concerned with eruptions, whereas the tectonic class are produced by the displacement of huge blocks of rock, and that in regions remote from volcanoes in California. The latter are known to have passed through the Hawaiian Islands chiefly as recorded by delicate instruments, and never at all violent. From destructive tectonic quakes Hawaii is immune.

The quaking is evidently produced by the passage of igneous lava beneath the surface, which endeavors to escape from imprisonment. As the containing walls are brittle, vertical fissures will be found along the line of movement, and the lava escapes through one or more of them. Neither of our great calderas discharges over its edges, though occasionally some of the fluid oozes through cracks high up, as on the border of Kilauea-iki in 1868. The vent is usually miles away from the center of action, and from one to three thousand feet lower down. Thus the main vent in Kau in 1868 was more than twelve miles distant from Kilauea and at the elevation of 1700 feet above the sea and about the same figure below the top of the lava in Halemaumau. The small area near the Half Way House is eight miles from Kilauea and 2500 feet above the sea.

Numerous fissures or faults were produced along the line of greatest tension southwest from Kilauea. Over a hundred are drawn upon the Kapapala map, the object being to show that a great many of them are to be found there, rather than the exact number. The largest one is sixty feet wide and sixty feet deep, miles in length, near the place of vent of the '68 flow.

Cracks are met with occasionally between Kilauea and Nanawale on the opposite side of the volcano, and several lines of them have been seen issuing radially from Mokuaweoweo.

If the fissures were made by the effort of the lava to escape from confinement in 1868, it follows that the line of maximum disturbance is indicated by them. It was also the source of the earthquake wave. And a more important fact is indicated—the seismic disturbances of 1868 in Kau originated in Kilauea. Some have imagined a focal disturbance at the Mohokea caldera or at Puu-o-Keokeo in order to embrace the later flow at Kahuku. The breakdown in the pit, the beginning of the lava discharge, the culmination of the quakes, the landslide and the sea wave were contemporaneous events—all from our most celebrated volcano.

Illustration C shows the relations of the several points of interest to each other and to the central source of disturbance. The fissures and the vents of 1868 are farther to the southwest than those of 1823. This 1823 flow has never been correctly represented upon the government maps. It is usually represented as starting from near the source of the 1880 flow, descending towards Kilauea and turning southwesterly to join the real discharge of 1823. The first named portion was prehistoric in time.

The map shows also where there may have been a species of tectonic movement supplementary to the volcanic, for twenty miles east of the 1823 flow, fully a mile back from the shore, there is a pali 1500 feet above the sea, which marks the locality of great faults. It is highest near the northwestern end. In 1868 there was a settling down of a part of the makai side of this pali. Along the Puna coast, from Kapoho to Apua, there was a subsidence of from four to seven feet. At Kaimu trees stood eight feet deep in sand and water. The plain at Kalapaua sunk about six feet, and the water was four or five feet deep over twenty acres of former dry land. The tide rises and falls within the walls of an old stone church.

To complete the block, there is a parallel line of fault and low pali for several miles along the upper trail from Puna to Kau after passing the Keauhou road; and towards Kilauea other precipitous walls are visible. And there was reported from Puna in 1909, in connection with an earthquake, another subsidence of several inches, thus suggesting a tendency for the falling of blocks of basalt in that neighborhood.

7. Last, but not least, came the flow of lava from Mauna Loa to Kahuku—the most spectacular of all the phenomena connected with the volcanic display of 1868. The lava which had appeared high up a week earlier, poured out from an opening about two miles mauka from the Kahuku ranch at five p. m. April 7. The people occupying the district fled from their homes and escaped, while their buildings, thirty-seven in number, were destroyed. The flow ceased after four days' activity. So far as known, it started at an opening 5600 feet above the sea, about ten miles distant from the shore, gushing out chiefly in a gash one mile long. There were four fountains of fire, rising about two hundred feet, except when two or more of them combined, when the height was greater. Large rocks, weighing many tons, were thrown out. The lava was blood red in color and very fluid, reaching the sea in two hours' time after it started. There was more than the usual amount of chrysolite present in both the aa and pahoehoe.

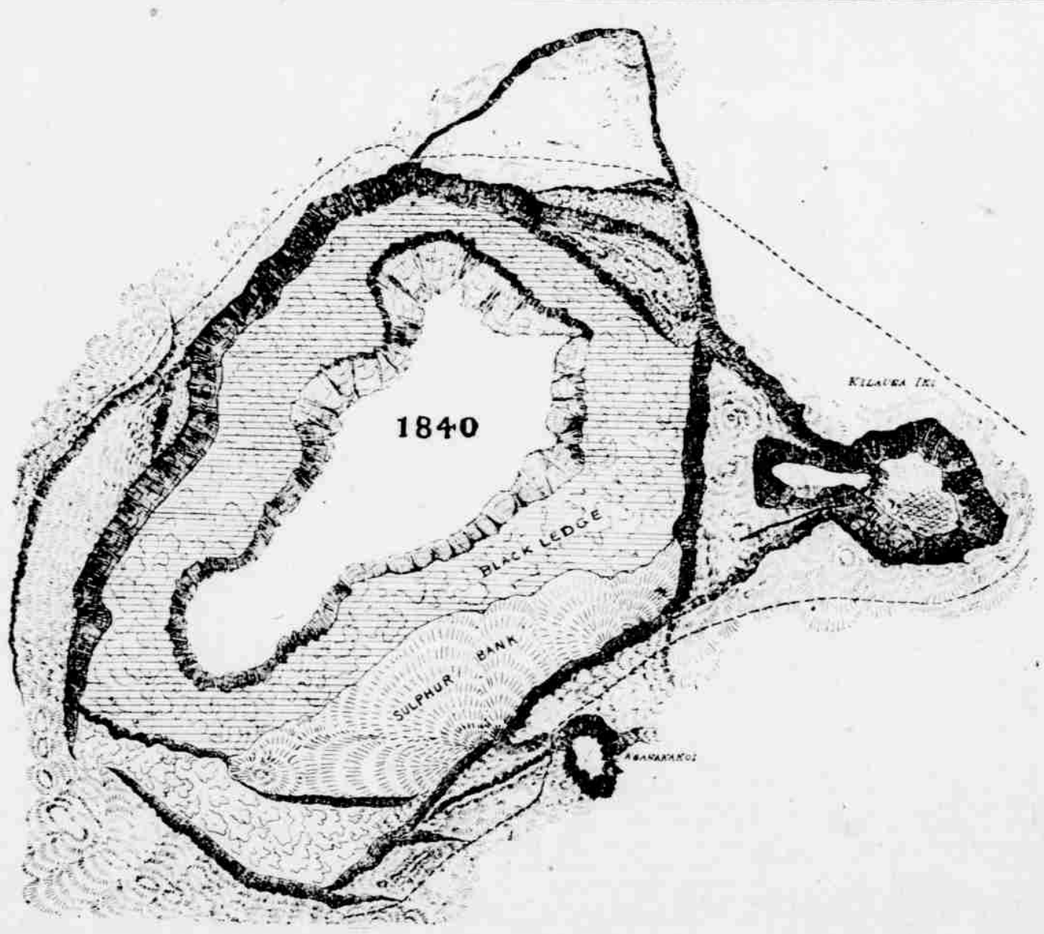
The course of the fissure coincides in the lower part of its way with the western edge of a plateau, a precipice called Mamalu, which reaches the sea at South Cape. The more elevated part is covered by excellent soil. I have compared this fissure to the efforts of the lumberman to split logs. The first blow of the ax cleaves the log a short distance; the second continues the split; likewise the additional strokes, till the log has been split through. So this vent commenced in prehistoric times and has been extended up the mountain through the pressure exerted by the later eruptions. The land on the east side of the fissure has been elevated in connection with the fracturing, thus forming a pali. There is no cinder cone at the head of the fissure, as is the case with the sources of the flows of 1855, 1880, etc., high up the mountain.

Three things are worth of note in connection with this flow: First, it commenced several days later than the Kilauean activity; second, the shocks were comparatively weak; third, the lava gushed out from a long fissure with great force and rapidity, instead of oozing slowly through a small orifice.

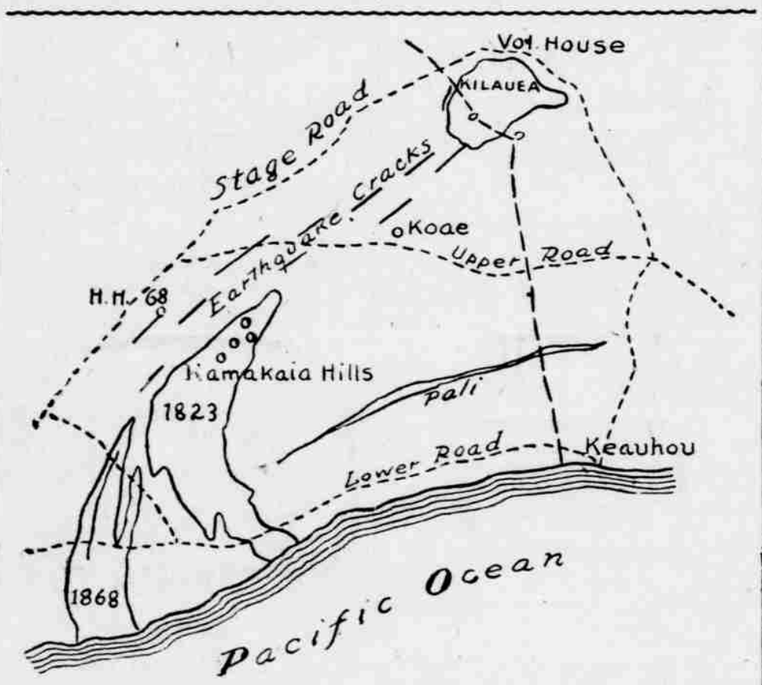
Just before the eruption a shower of ashes and pumice covered the region for many square miles. These must not be confounded with the thick deposits of similar materials scattered from near Kilauea to the South Cape and thrown out in prehistoric times. Many of them have a yellow color and constitute the basis for the rich soils of the sugar plantations.

General Conclusion.

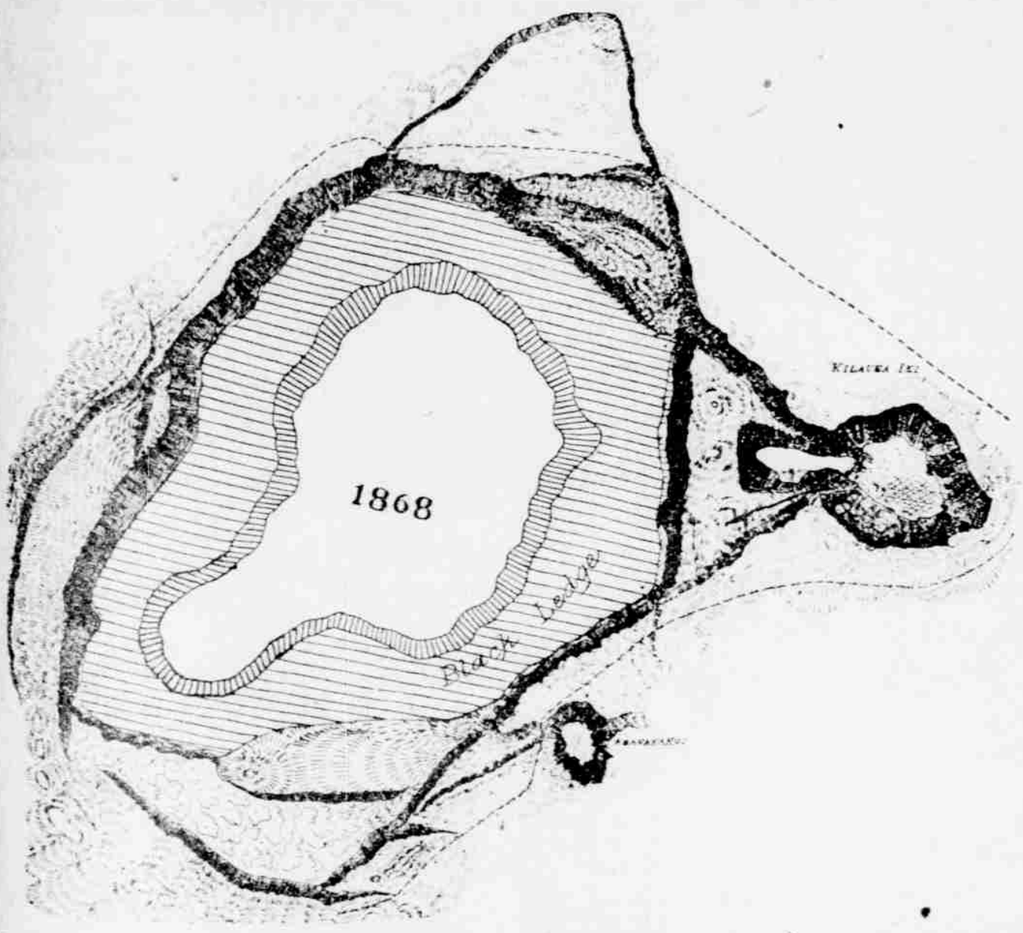
With the fact established of the discharge of lava on April 2 on the lower road in Kau, we can understand the close association with it of the earthquakes, the formation of fissures, the landslide and the sea wave. All the energy thus displayed had its origin in Kilauea, leaving to Mauna Loa the vigorous action of April 7 at Kahuku. The nearness in time of the discharges from the two volcanoes suggests a sympathy between them. Both started from the same source. When the pressure is the greatest, the lava flows from both volcanoes; when less, the igneous manifestation may be confined to either one of the calderas. In 1868 the force manifested was the greatest ever known in the whole history of the Island.



THE CRATER OF KILAUEA IN 1840.
Black Ledge 650 feet deep. Lower pit 992 feet deep.



THE AFFECTED DISTRICT.



THE CRATER OF KILAUEA IN 1868.